APPENDIX 30A

VALUING A LEASE RENEWAL OPTION

Leases often contain a variety of options written explicitly into the lease contract, modifying the rights and responsibilities that the landlord and tenant would otherwise face. Some options belong to the tenant, and some to the landlord. In general, it is rather complicated to quantify fully and rigorously the effect such options have on the value of the lease to either party. The most sophisticated approach involves the use of financial option valuation theory (OVT), which you were introduced to in Chapter 27. However, unlike the case there where the underlying state variable was the asset value as determined in the property asset market, for lease analysis, typically the underlying state variable is the rent as determined in the space market. Steve Grenadier and others have developed the application of OVT to lease valuation.[1] However, a less rigorous, more intuitive technique known as decision tree analysis (DTA) is sometimes used to quantify approximately option values in this context. In this appendix, we will demonstrate this approach for a simple numerical example of a tenant's renewal option.

Consider again the example five-year lease A from section 30.3.2, with a nominal rent of $20/SF. Recall that we estimated the effective rent of this lease at $15.44 from the landlord's perspective, using a discount rate of 7 percent. Now suppose that the lease also grants the tenant an option to renew after five years, for another five years, at $20/SF. The effect of this renewal on the effective rent from the landlord's perspective can be quantified in four computational steps.

Step 1. *Describe the subjective probability distribution of market rents at the time the option matures, based on current information.* In our example, suppose the landlord believes that at the end of five years (the lease first term expiration date), there is a 50 percent chance that rents in the relevant space market will be $22/SF, and a 50 percent chance that they will be $18/SF. This expectation is depicted in a binomial branch diagram in Exhibit 30A-1A.[2]

Step 2. *Quantify the present value of the renewal option under each future scenario.* Assuming the discount rate is still 7 percent, if market rents are $22/SF, then the option to renew the lease for five years at $20/SF will be worth[3]

[1]See, in particular, Grenadier (1995b and 2005), for an elaboration of this approach, which is quite technical. A broader, less technical treatment that is widely used is in Dixit and Pindyck (1994), with another more recent useful guide being Trigeorgis (2002). The binomial option model presented in this book in Chapter 27 and Appendix 27 on the CD can be applied to analyze lease options, only with the modification of making effective rent the underlying state variable rather than asset price (which has implications for the projected drift rate), and with option values and leasing decisions based on the market effective rent in each node. Keep in mind that many lease options are "European" in nature. Also bear in mind that lease options "at market rents" are not really "options" in the classical financial economic sense (for such options would by definition have a value of zero), but are actually "rights of first refusal" to avoid the "holdup problem" described in the box in section 30.3.

[2]In general, the trees in DTA can have more than two branches. Each node represents a decision or valuation point, and the branches going forward in time from each node specify mutually exclusive, exhaustive subsequent states conditional on the node from which they branch. Thus, the probabilities across all branches coming out of each node must sum to 100 percent, as these are probabilities conditional on the node having been arrived at.

[3]Some indication of the reasonable expectation of forward short-term interest rates can be obtained from examination of the yield curve in the bond market, only after accounting for the interest rate risk premium component of the bond yield. (See the discussion of ARMs in section 17.1.2 of Chapter 17 and the discussion of the yield curve in section 19.1.3 of Chapter 19.)

EXHIBIT 30A-1A
Decision Tree Approach to Valuing a Lease Renewal Option: Expected Rental Market Conditions and Probabilities for the Example Lease A

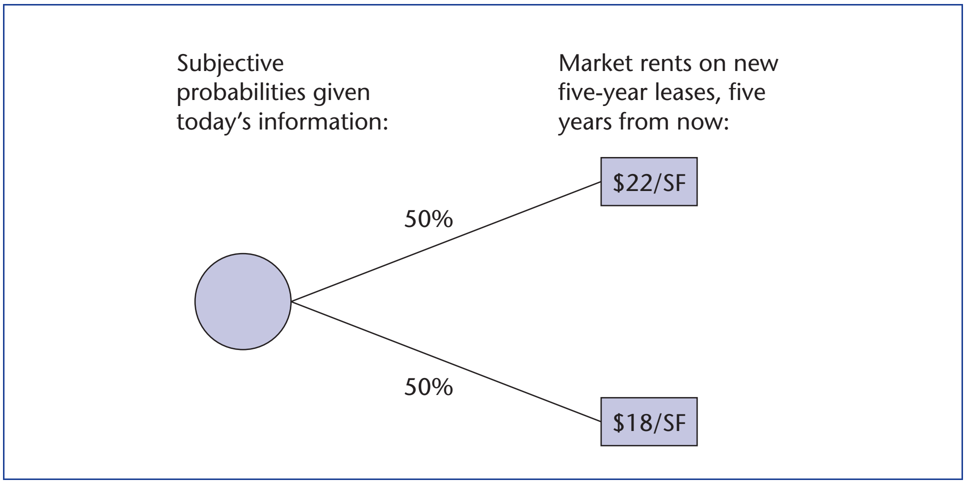
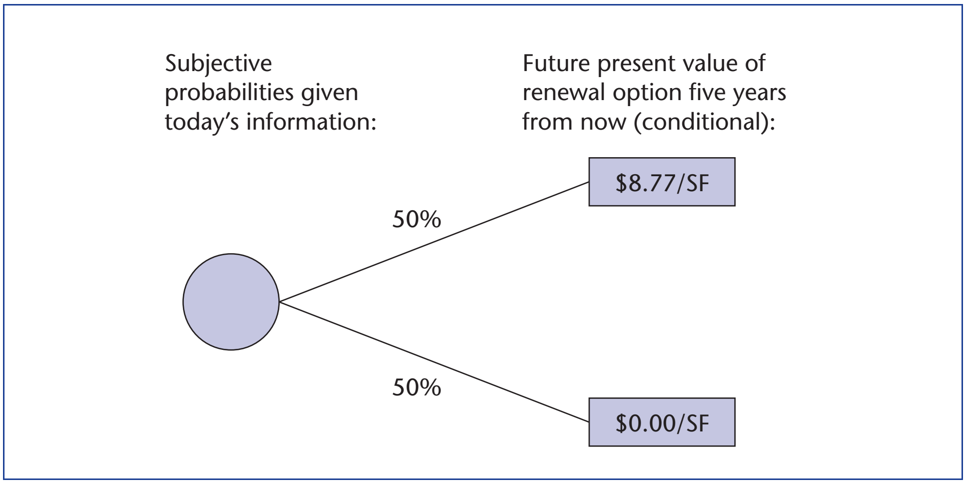


EXHIBIT 30A-1B
Decision Tree Approach to Valuing a Lease Renewal Option: Conditional Future Values and Probabilities in the Example Lease A



$$LPV_5 = (\$22 - \$20) + \frac{\$22 - \$20}{1.07} + \frac{\$22 - \$20}{1.07^2} + \frac{\$22 - \$20}{1.07^3} + \frac{\$22 - \$20}{1.07^4} = \$8.77$$

Note that the landlord loses (and tenant receives) only the difference between the projected market rent ($22) and the option rent ($20) if the tenant elects to exercise the renewal option. Also note that as the rent is paid in advance (with no up-front concessions presumed for a new lease), the exercise of the renewal option has its initial $2 incremental impact at the end of Year 5 (beginning of Year 6), and so is not discounted in the computation of the Year-5 present value.

On the other hand, if market rents are $18/SF as of the end of Year 5, then the lease renewal option will be worth nothing, as there would be no point in the tenant renewing at $20 when she can get a lease for $18 in the then-prevailing market. So the option simply would not be exercised.

The decision tree representation of the conditional option value as of the end of Year 5 is shown in Exhibit 30A-1B

Step 3. *Quantify the risk-adjusted present value today (time 0) of the future option value.* This is done in two steps that can usually be done in either order.[4]

[4]The order does not matter because of the distributive property of addition and multiplication: $[(0.5)x + (0.5)y]/(1 + r) = (0.5)x/(1 + r) + (0.5)y/(1 + r)$.

Step 3a. *Discount each conditional future value back to the present.* Normally, a pretty high opportunity cost of capital (OCC) should be used in this discounting because options tend to be pretty risky, especially if they are not deeply "in the money" (i.e., almost certain to be exercised). For example, if existing lease payments are discounted at 7 percent, and unlevered property cash flows are generally at, say, 9 percent, then future option values might discount at, say, 15 percent:[5]

$$\text{PV}(\$8.77 \text{ in 5 yrs.}) = \$8.77/(1.15)^5 = \$4.36$$
$$\text{PV}(\$0.0 \text{ in 5 yrs.}) = \$0/(1.15)^5 = \$0$$

Step 3b. *Sum across the possible scenario present values, weighted by their present subjective probabilities of occurrence.* In this case,

$$(0.50)\$4.36 + (0.50)\$0 = \$2.18$$

This gives the present value today of the lease renewal option. This is a negative value (or positive cost) to the landlord, who gives the option to the tenant.

Step 4. *Convert the renewal option present value to an impact on effective rent.* Using the annuity formula (for cash flows in advance), a PV of $2.18 equates to a five-year 7 percent annuity of $0.50 per year:

$$\$0.50 = (7\%)(\$2.18)/\{(1+7\%)[1-1/(1+7\%)^5]\}$$

So the impact of the renewal option is to reduce the effective rent of lease A from $15.44 to $14.94 for the landlord.[6]

[5]Note that the risk in the option will probably change over time as new information arrives relevant to the likelihood of option exercise. The difficulty of knowing the correct discount rate to employ in this step is a major weakness in the DTA approach (as compared, for example, to the more rigorous, but much more technical and complex, OVT-based approach).

[6]If the option alternatives involve different horizons, then the conversion to annualized values should be done in Step 2 rather than Step 4.